

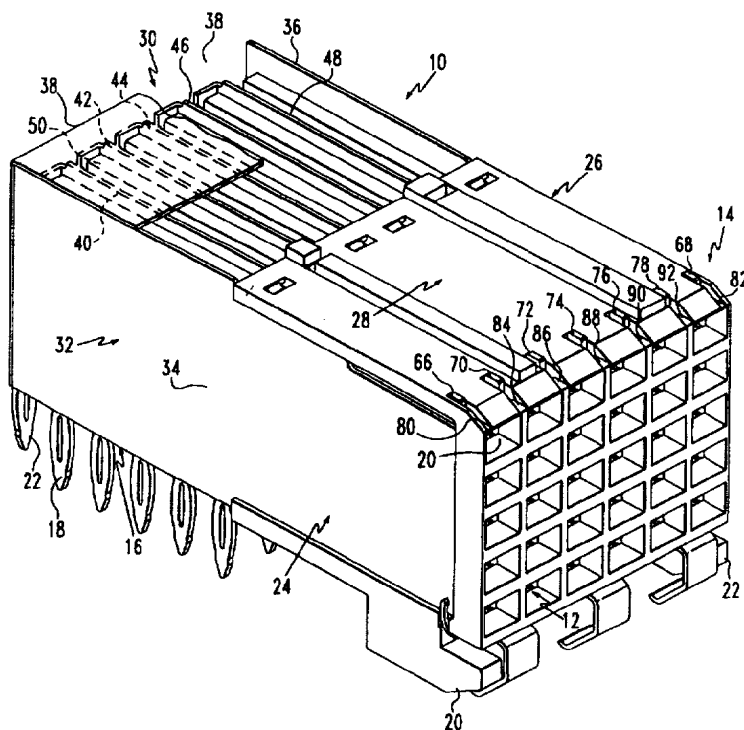


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>H01R 13/658</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 98/08276</b> <b>(43) International Publication Date:</b> 26 February 1998 (26.02.98)
<b>(21) International Application Number:</b> PCT/US97/14631 <b>(22) International Filing Date:</b> 20 August 1997 (20.08.97)  <b>(30) Priority Data:</b> 60/024,220                      20 August 1996 (20.08.96)                      US  <b>(71) Applicant (for all designated States except US):</b> BERG TECHNOLOGY, INC. [US/US]; One East First Street, Reno, NV 89501 (US).  <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> SHUEY, Joseph, B. [US/US]; 3425 Logan Street, Camp Hill, PA 17011 (US). STONER, Stuart, C. [US/US]; 559 Fishing Creek Road, Lewisberry, PA 17339 (US).  <b>(74) Agents:</b> LONG, Daniel, J. et al.; 825 Old Trail Road, Etters, PA 17319 (US).		<b>(81) Designated States:</b> CN, JP, KR, SG, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i>

**(54) Title:** HIGH SPEED MODULAR ELECTRICAL CONNECTOR AND RECEPTACLE FOR USE THEREIN**(57) Abstract**

A receptacle (10) for an electrical connector comprising a housing (14) having a first face (12) and a second face (16) and a plurality of signal conducting terminals (18) each extending from the first face to the second face and the housing having a plurality of longitudinal sides (24, 26, 28) interposed between the first face and the second face. A conductive shielding (32) is superimposed over at least some of the longitudinal sides. Interior conductive shielding (40-48) is interposed between at least some of said signal conducting terminals.



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## HIGH SPEED MODULAR ELECTRICAL CONNECTOR AND RECEPTACLE FOR USE THEREIN

### Background of the Invention

1. **Field of the Invention:** The present invention relates to  
5 electrical connectors and more particularly to modular connectors for use  
in connecting a daughter printed wiring board to a mother printed wiring  
board.
2. **Brief Description of Prior Developments:** In the manufacture of  
10 computers and various other electronic assemblies, daughter boards are  
commonly connected to mother boards by means of a connector having a  
receptacle having a plastic housing and a first and second face wherein  
terminals are connected in one face to the daughter board and at the  
other to a header connected to the mother board. Various arrangements  
have been suggested to ground such connectors to the mother or  
15 daughter boards but such arrangements have tended to complicate the  
construction of the connector. A need, therefore, exists for simple and  
inexpensive means for grounding connectors between mother and  
daughter boards. There is also a need for such a connector which  
reduces crosstalk and increases band width.

20

### Summary of the Invention

- The receptacle of the present invention comprises a housing having  
a first face and a second face and a plurality of signal conducting means.
- 25 Each of these terminals extends from said first face to said second face.  
The housing has a plurality of longitudinal sides interposed between said  
first face and said second face, and there being a conductive shielding  
means superimposed over at least some of said longitudinal sides.

Interior conductive shielding means are interposed between at least some of said signal conductive means.

In the electrical connector of the present invention the above described receptacle is connected to a daughter board through a shielded header. The header has two end walls and a medial wall and is comprised of a conductive material, preferable a suitable metallic alloy. A plurality of apertures extend through the medial wall and retain signal pins which contact the terminals in the receptacle. There is a first and second face on the medial wall. The first face interfaces with the second face of the receptacle. The second face abuts the printed wiring board. On the second face there are a plurality of recesses into which conductive pins are press fitted to ground the connector.

### **Brief Description of the Drawings**

The present invention is further described with reference to the accompanying drawings in which:

Fig. 1 is a cut-away perspective view of the receptacle of the present invention;

Fig. 2 is a perspective view of the exterior shielding used in the receptacle shown in Fig. 1;

Fig. 3 is a perspective view of the interior shielding used in the receptacle shown in Fig. 1;

Fig. 4 is a perspective view of the insulative housing used in the receptacle shown in Fig. 1;

Fig. 5 is a perspective view of the composite terminals and insulative frames used in the receptacle shown in Fig. 1;

Fig. 6 is a perspective view of the exterior shielding engaged to one of the interior shields;

Fig. 7 is a side elevational view of the receptacle shown in Fig. 1 which is cut-away to show terminal arrangement;

5 Fig. 8 is a front elevational view of the receptacle shown in Fig. 1;

Fig. 9 is a cross sectional view through IX-IX in Fig. 8;

Fig. 10 is a cross sectional view through X-X in Fig. 8;

Fig. 11 is a vertical cross sectional view through an insulative frame as is shown in Fig. 4;

10 Fig. 12 is a vertical cross sectional view of the receptacle shown in Fig. 1 engaged with a header.

Fig. 13 is a front perspective view of a second preferred embodiment of the receptacle of the present invention;

Fig. 14 is a rear perspective view of the receptacle shown in Fig. 13;

15 Fig. 15 is a rear elevational view of the receptacle shown in Fig. 13;

Fig. 16 is a schematic top cutaway view showing the receptacle engaging a printed circuit board;

Fig. 17A is a cross sectional view through XVII - XVII in Fig. 15;

20 Fig. 17B is a cross sectional view similar to Fig. 17A in which the receptacle is shown engaging a header;

Fig. 18 is a side elevational view of a shield used in a receptacle used in Fig. 13; and

Fig. 19 is a side elevational view of contacts used in the receptacle shown in Fig. 13.

25 **Detailed Description of the Preferred Embodiments**

Referring particularly to Figs. 1 - 2, the receptacle is shown generally at numeral 10. The receptacle has a first face 12 on a front

insulative housing shown generally at numeral 14. The receptacle also has a second face 16 on its bottom side, and conductive signal terminals as at 18 extend from the first face to the second face. The first face has a plurality of openings as at 20 where, as is explained hereafter, pins from a header engage the signal terminals. As is conventional, the receptacle also includes ground pins as at 22. The receptacle also includes lateral longitudinal sides 24 and 26 and a top longitudinal side 28. In opposed relation to the first face there is an end 30. The longitudinal 24 and 26 and the end 30 are covered by a U-shaped shield 32. This shield is comprised of longitudinal sections 34 and 36 which are superimposed, respectively over longitudinal sides 24 and 26. In section 38 of the U-shaped shield 32 is superimposed over the end 30 of the receptacle 30. On longitudinal side 28 rearwardly of the insulative housing there is also a top shield (not shown).

Referring particularly to Figs. 1, 3 and 6, there are parallel longitudinal internal shielding walls 40, 42, 44, 46 and 48. Between these internal walls there are longitudinal spaces as at 50 (Fig. 3). Each of the internal walls also has a transverse section as at 52 and 53 (Fig. 3). Each of these transverse sections has a pair of vertical latches as at 54 and 56 on transverse section 52 and 58 and 60 on transverse section 53. These vertical latches engage horizontal eyelets as at 62 and 64 (Figs. 2 and 6). On the front top edge of the longitudinal section 34 of U-shaped shield 32 there is a spring latch 66. On the front top section of longitudinal section 36 of the U-shaped shield 32 there is also a spring latch 68. Similarly internal shielding wall 40 has a front spring latch 70, internal shielding wall 42 has a shielding latch 72, internal shielding wall 44 has a front spring latch 74, internal shielding wall 46 has a front

shielding latch 76 and internal shielding wall 48 has a front spring latch 78.

Referring particularly to Fig. 4, there are side slots 80 and 82 in the insulative housing. These slots are engaged, respectively, by spring  
5 latches 68 and 70. Between these slots there are medial slots 84, 86, 88, 90 and 92 which are engaged, respectively, by spring latches 70, 72, 74, 76 and 78 on the internal shielding walls.

Referring particularly to Figs. 1 and 4 - 5, it will be seen that the terminals are enclosed within insulative frames 94, 96, 98, 100, 101 and  
10 102. These frames have, respectively, frame latches 103, 104, 106, 108, 110 and 112. These frame latches engage, respectively, apertures 114, 116, 118, 120 and 122 in the insulative housing (Fig. 1).

Referring to Figs. 5 and 7 - 8 particularly, it will be seen that in addition to terminal 18, insulative frame 94 also holds signal terminal  
15 124, 126, 128 and 130. Each of these terminals extends first upwardly and then horizontally. Each of these terminals has, respectively, at its horizontal terminal end a split pin engagement section 132, 134, 136, 138 and 140. As is conventional, the receptacle also has a pair of code key holders 142 and 144 and press pins 146, 148 and 150.

20 Referring to Fig. 11, an insulative frame is shown as being vertically bisected. This bisected frame is centrally recessed and has a plurality of contact receiving structures 151a - 151h.

Referring to Fig. 12, the receptacle engages a header shown generally at numeral 152. The header has a pair of end walls 154 and  
25 156 and a medial wall. There are apertures in the medial wall through which conductive pins as at 160 extend to engage the first face of the

receptacle and be received in the split pin engagement sections of the terminals.

A second embodiment is shown in Figs. 13 - 20. Referring particularly to Fig. 13, the front face of the receptacle is shown generally at numeral 210 and a bottom face at 211. On this face there are conventional pin receiving apertures as at 212 for connection with the plug. The receptacle also includes, as is conventional, a press attachment peg 214 and location pegs 216 and 218. Also included are spacers 220 and 222 and polarization alignment keys 224 and 226.

Referring particularly to Figs. 14 - 15, the top face 228, rear face 230 and a side face 232 and 234 are shown in greater detail. From this figure it will be seen that there are slots as at 236 and 237 for receiving shields in the top face, bottom face and rear face which run parallel to the side faces. Between the shields there are elongated contact receiving slots as at 238 and 239. At vertical spaced intervals along the shield receiving slot there are also pairs of grooves 240 and 242.

Referring particularly to Figs. 16 - 20 signal contacts as at 244, 246, 248, 250 and 252 pass through each of the contact receiving slots in the receptacle. These contacts are connected at one end to the printed circuit board 254 (Fig. 16). (It will be understood that the contacts between individual sets of shields all extend rearwardly by the same overall length although in Fig. 16 engagement of the printed circuit board schematically shows several different rearward positions to illustrate various positions on the board which may be engaged by the contacts.) At their other end they have a V-shaped structure as at 256 to engage pins at the pin receiving apertures. Referring particularly to Figs. 17A - 17B and 19 the shields have ground pins as at 258, 260 and 262 that pass



through the bottom face of the receptacle to be grounded to the PCB. The shield also has a lower resilient ground 264 which extends downwardly through a lower slot in the receptacle then rearwardly to be grounded to a shrouded header 265 (Fig. 17B). Similarly the shield has an upper  
5 resilient ground structure 266 which passes through one of the slots in the upper face of the receptacle to be grounded to a header (not shown). A header which would be suitable for engagement with these resilient ground projections would, for example, be either one shown in U.S. Patent Application Serial No. 08/277,989 filed April 4, 1995 and assigned to the  
10 assignee of this application.

It will be appreciated that there has been described a simple and inexpensive receptacle which provides for effective shielding and grounding between mother and daughter boards.

While the present invention has been described in connection with  
15 the preferred embodiments of the various figures, it is to be understood that other similar embodiments may be used or modifications and additions may be made to the described embodiment for performing the same function of the present invention without deviating therefrom. Therefore, the present invention should not be limited to any single  
20 embodiment, but rather construed in breadth and scope in accordance with the recitation of the appended claims.

**Claims****WHAT IS CLAIMED IS:**

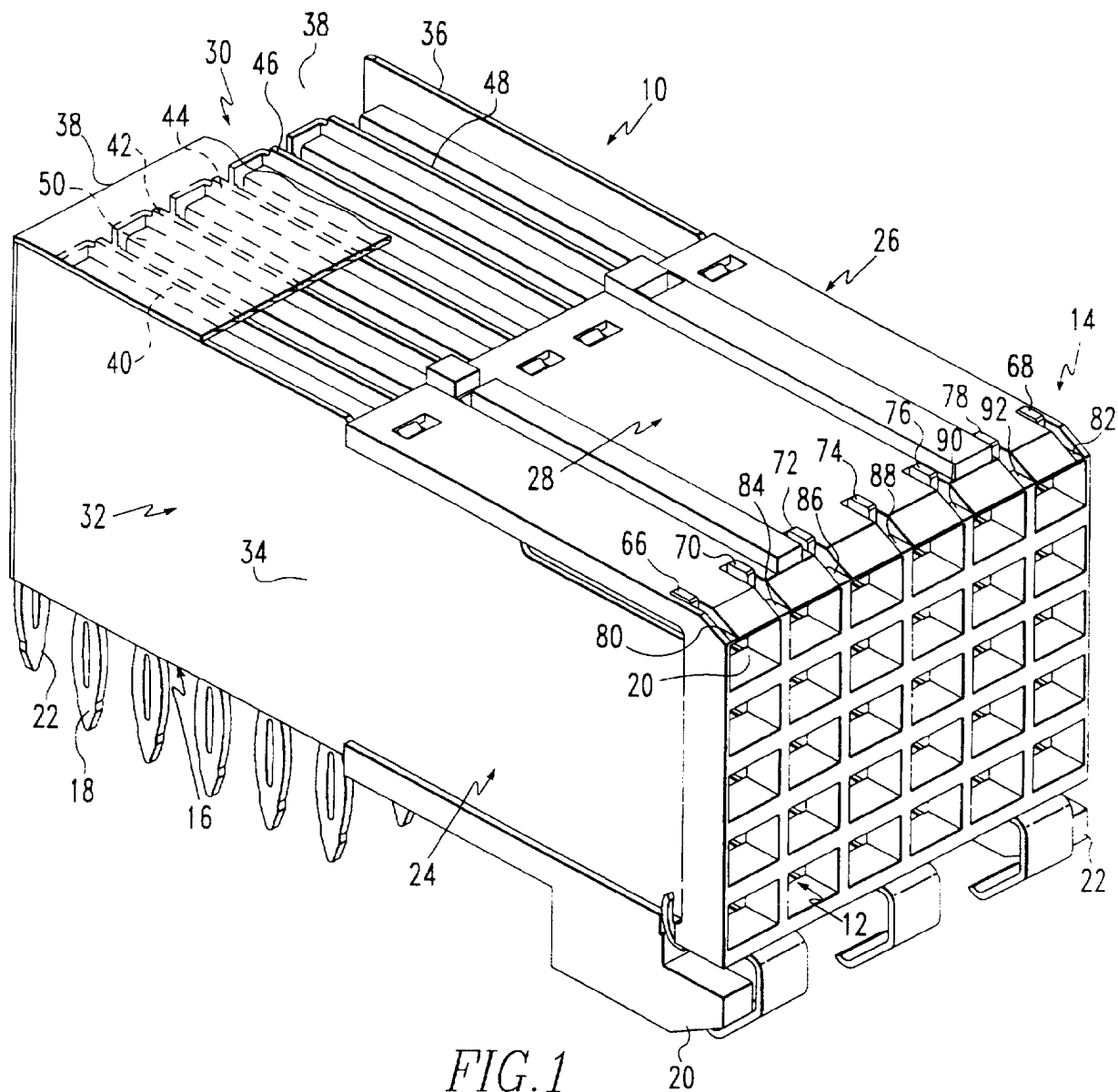
1. A receptacle for an electrical connector comprising a housing having a first face and a second face and a plurality of signal conducting means  
5 each extending from said first face to said second face and said housing having a plurality of longitudinal sides interposed between said first face and said second face and there being a conductive shielding means superimposed over at least some of said longitudinal sides and there being interior conductive shielding means interposed between at least  
10 some of said signal conductive means.
2. The receptacle of claim 1 wherein internal shielding means comprises a plurality of parallel longitudinal walls to form a plurality of longitudinal spaces between said longitudinal walls and one of said  
15 conductive means is positioned in each of said longitudinal spaces.
3. The receptacle of claim 2 wherein the conductive signal means are retained in a plurality of insulative frames.
- 20 4. The receptacle of claim 3 wherein the conductive signal means are flattened to be interposed between adjacent internal conductive shielding means.
5. The receptacle of claim 4 wherein latching means are provided to fix  
25 each of said insulative frames to the housing.

6. The receptacle of claim 5 wherein each of the internal longitudinal walls has a transverse extension and each of said transverse extensions has a means for engaging said extensions to said exterior shielding.
- 5 7. The receptacle of claim 6 wherein the transverse extension has a vertical latch which engages a horizontal eyelet projecting from the exterior shielding means.
8. The receptacle of claim 7 wherein each of the internal longitudinal  
10 shielding means has a means for connecting said shielding means to the header.
9. The receptacle of claim 8 wherein the means for connecting said shielding means to the header are spring connecting means.
- 15 10. The receptacle of claim 1 wherein grounding means are provided.
11. An electrical connector comprising in combination a receptacle comprising a receptacle for an electrical connector comprising a housing  
20 having a first face and a second face and a plurality of signal conducting means each extending from said first face to said second face and said housing having a plurality of longitudinal sides interposed between said first face and said second face and there being a conductive shielding means superimposed over at least some of said longitudinal sides and  
25 there being interior conductive shielding means interposed between at least some of said signal conductive means and a housing having a first face and a second face and a plurality of conductive means each

extending from said first face to said second face and a header having a conductive housing comprising generally parallel end walls with opposed inner faces and a medial wall is interposed between said opposed parallel end walls, said medial wall having a first face and a second face wherein

5   said first face of the medial wall is adjacent to the second face of the receptacle element and a plurality of passages extend between the first and second faces of the medial walls and a plurality of conductive signal pins pass through at least some of said passages and a separate grounding means is attached to the conductive housing of the header.

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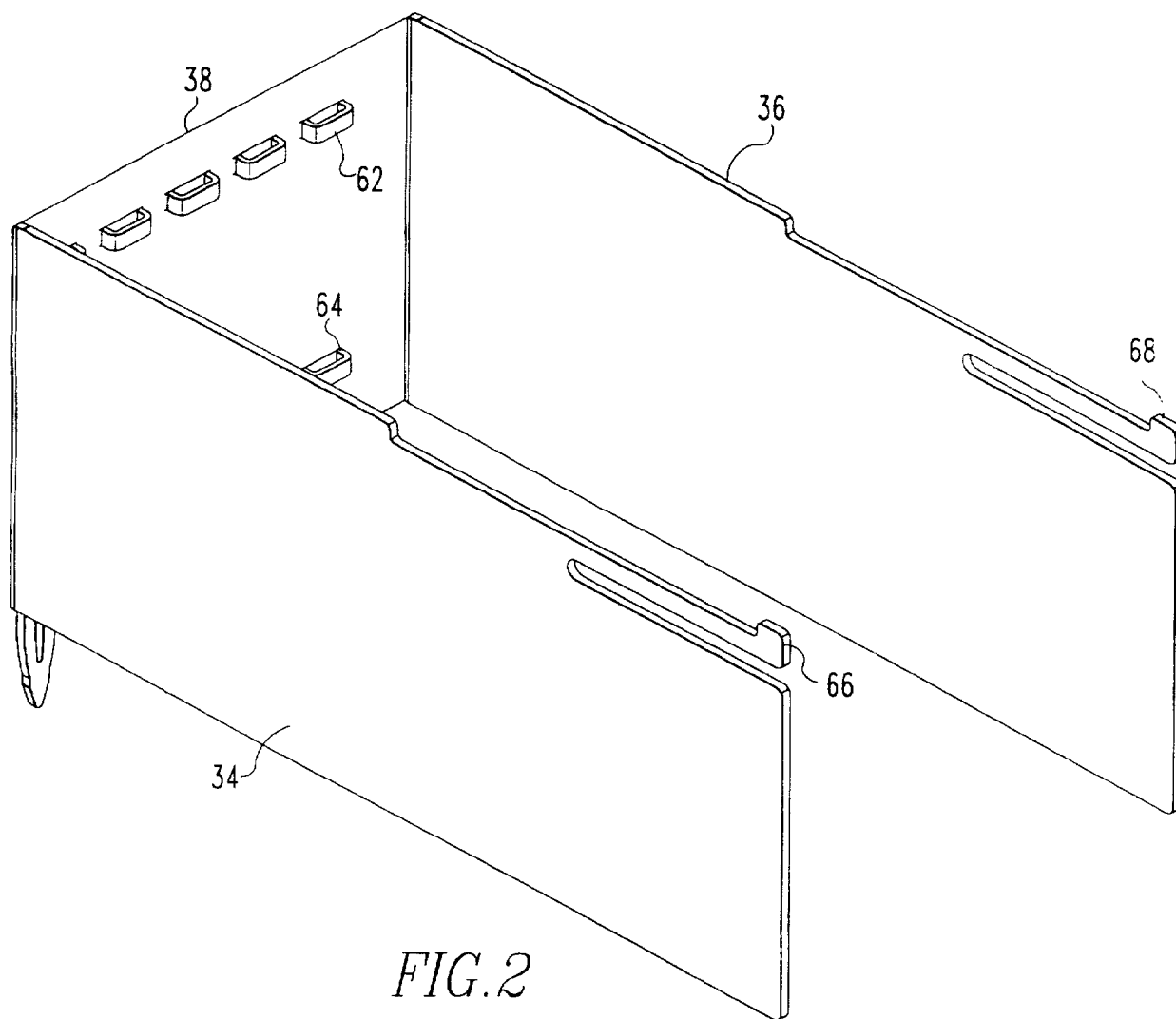


FIG. 2

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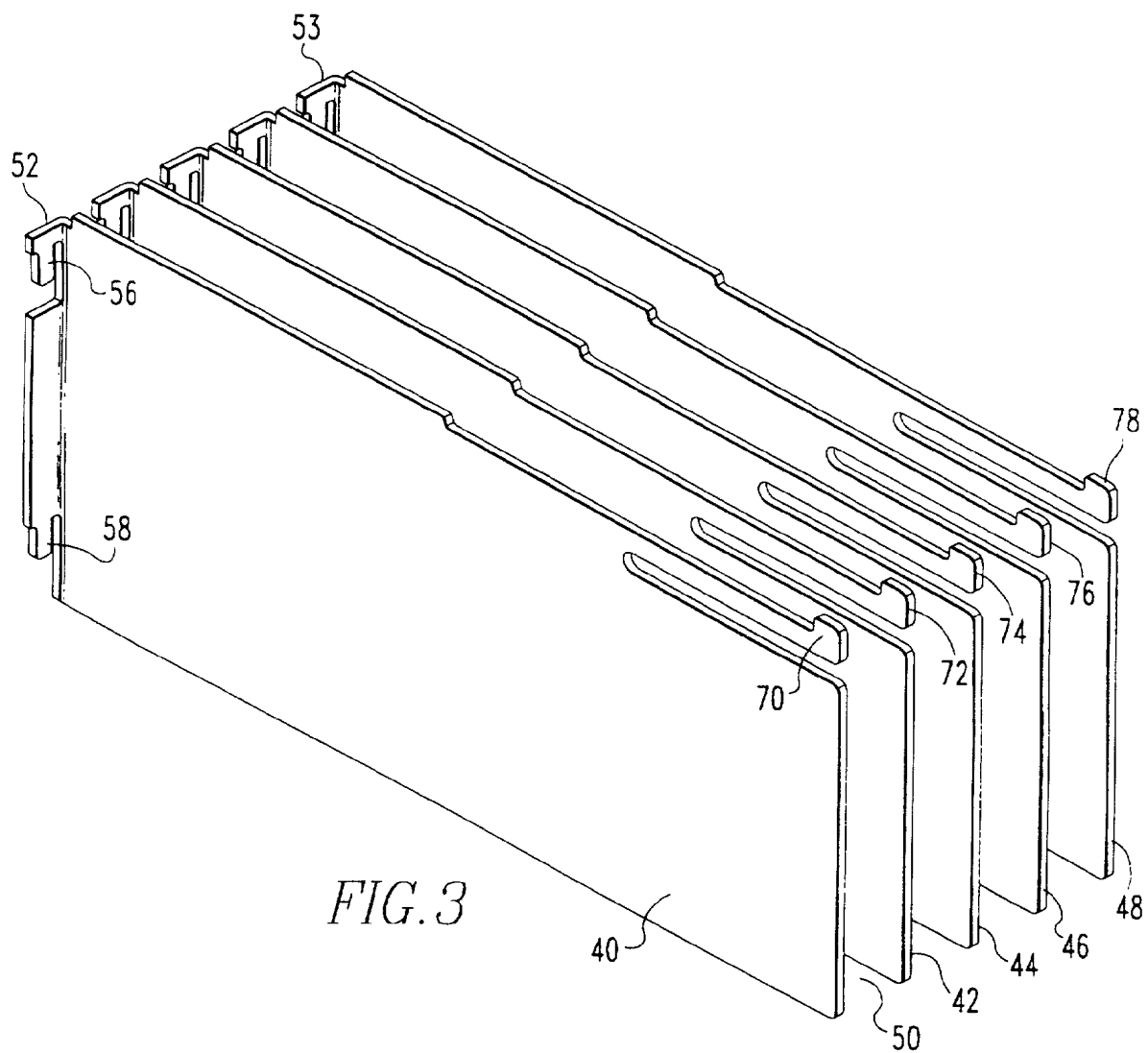


FIG. 3

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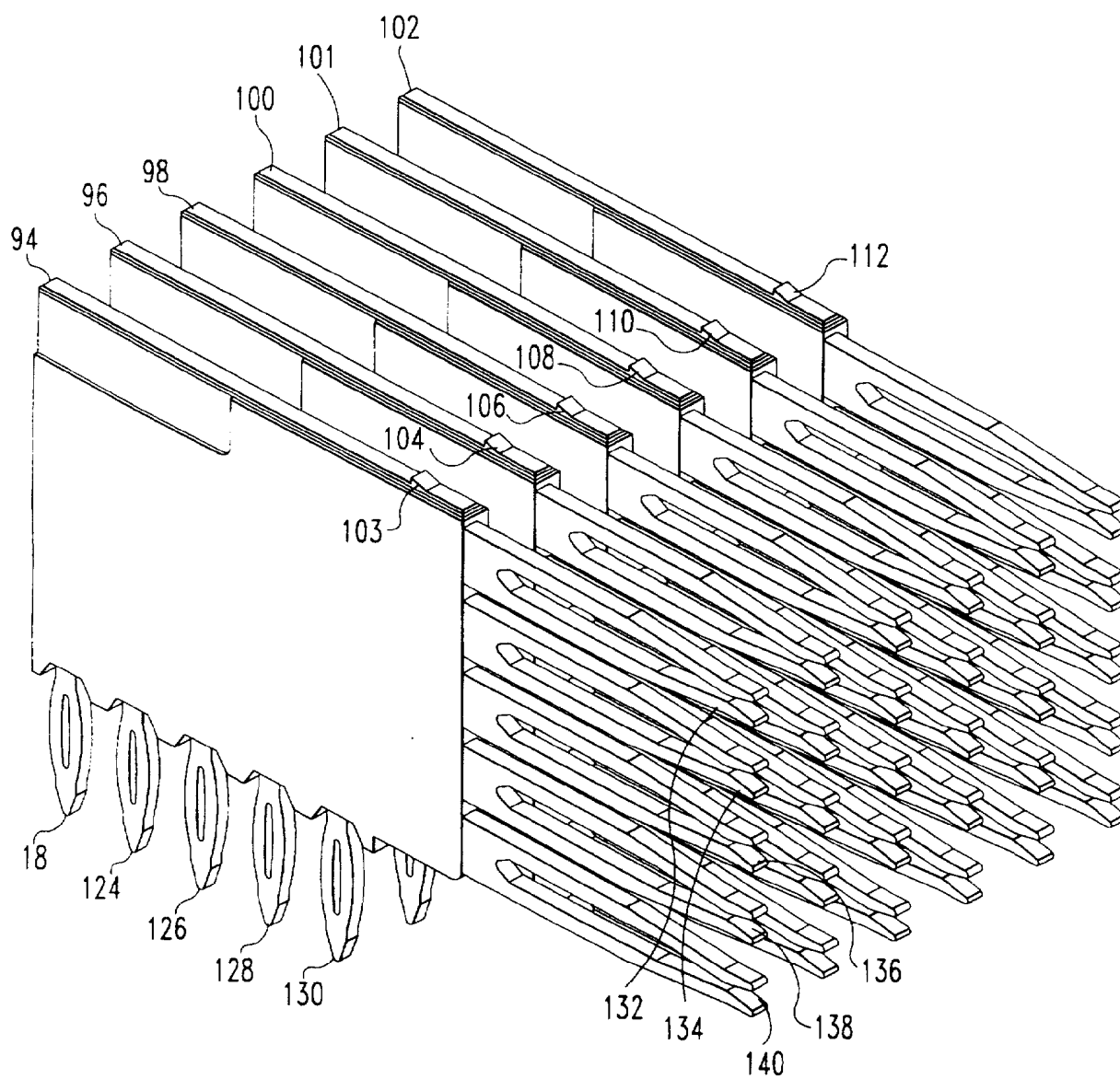


FIG. 5



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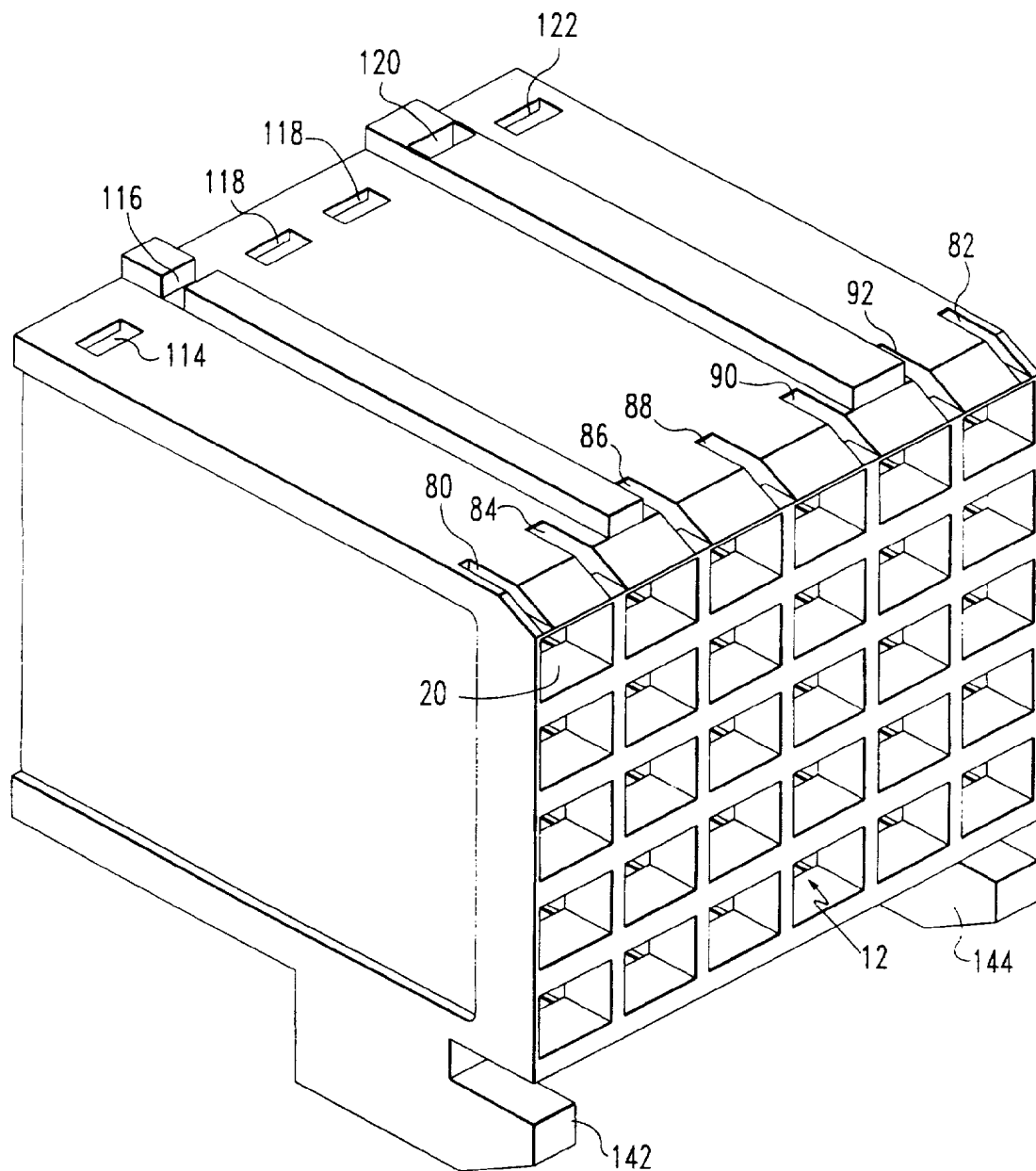
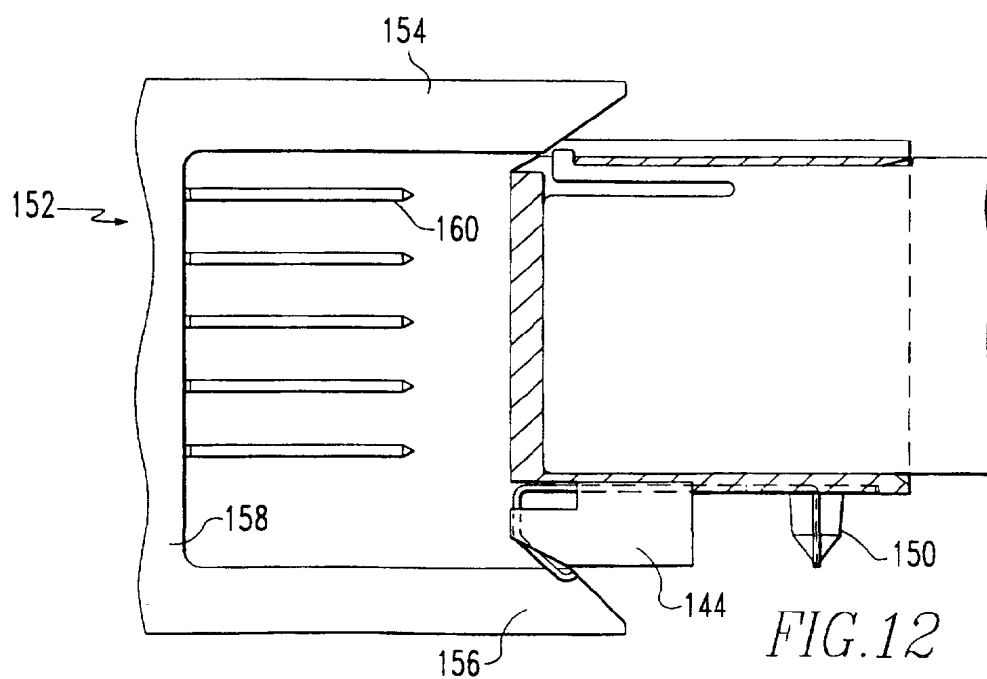
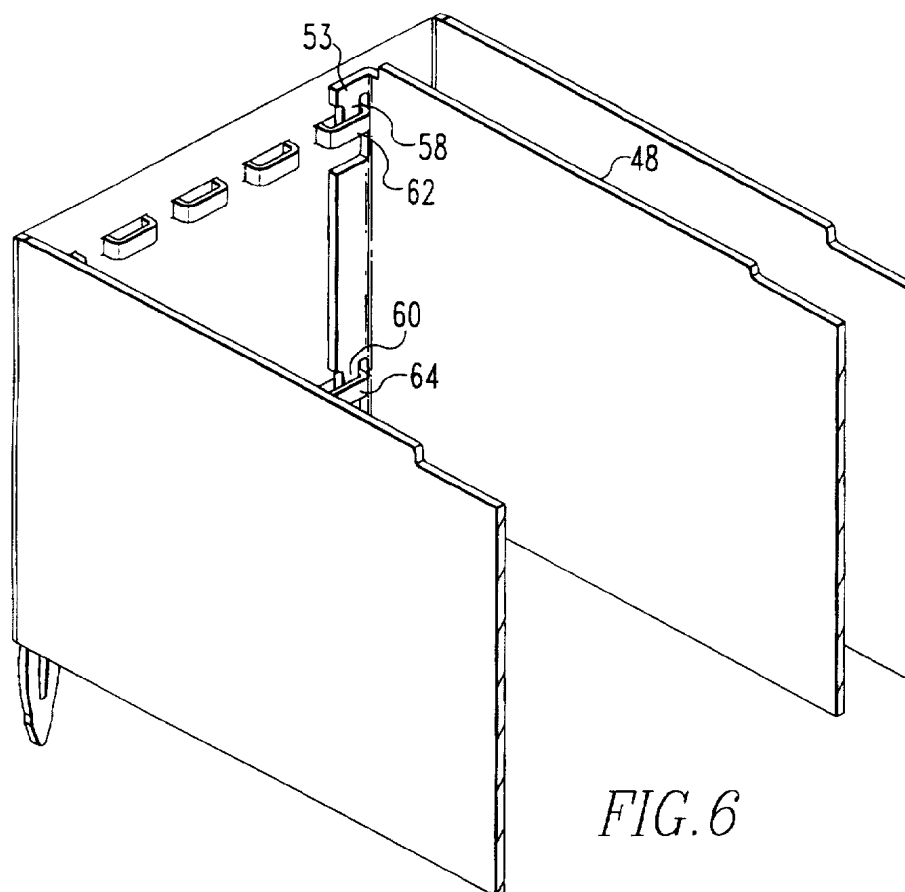
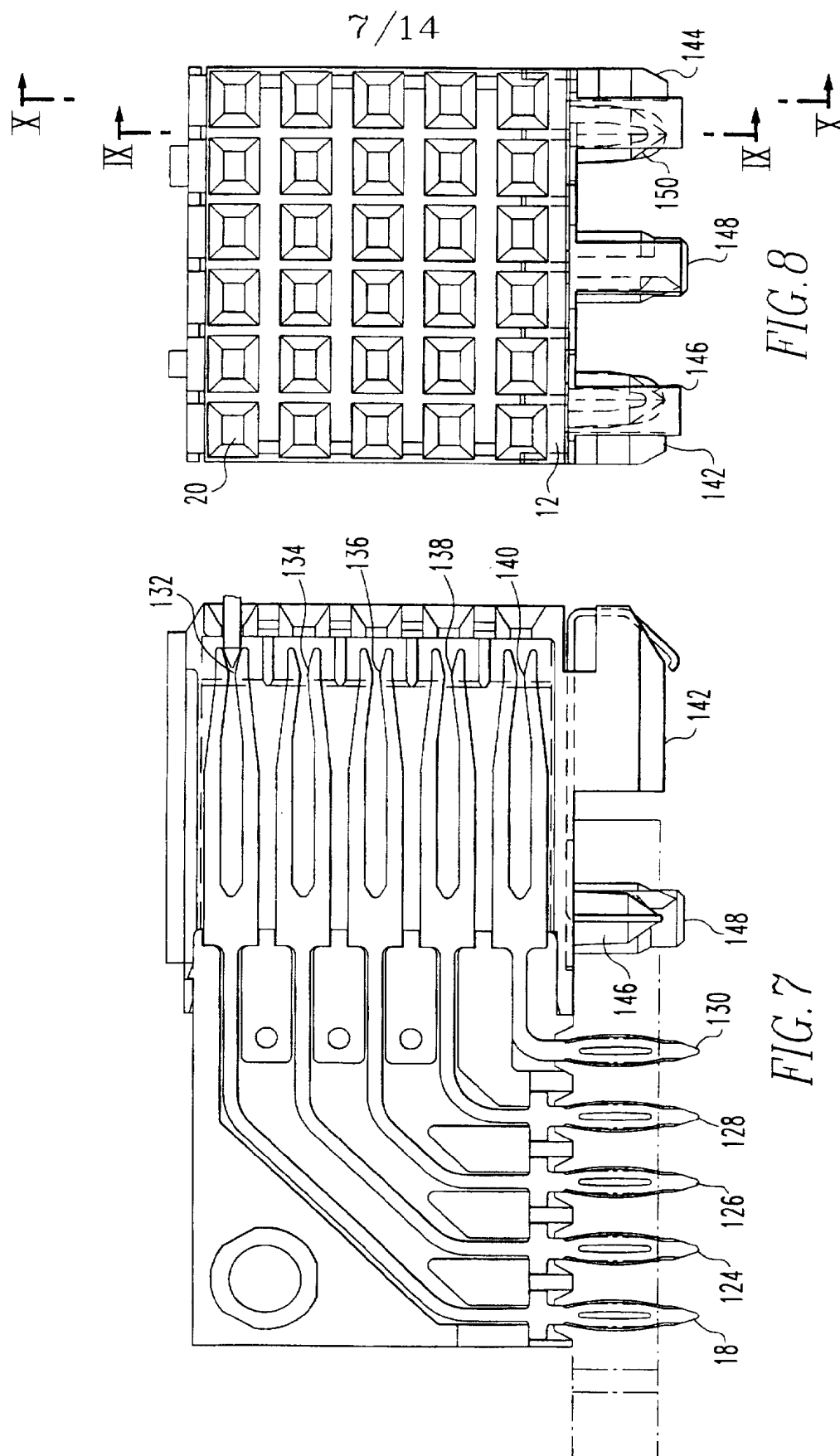
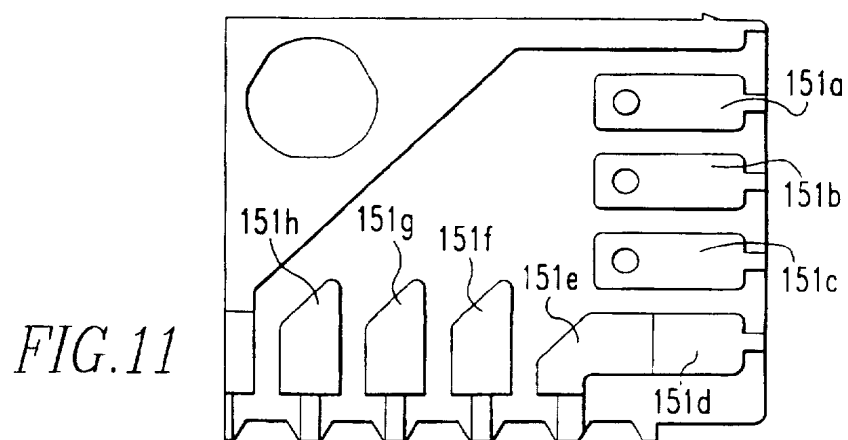
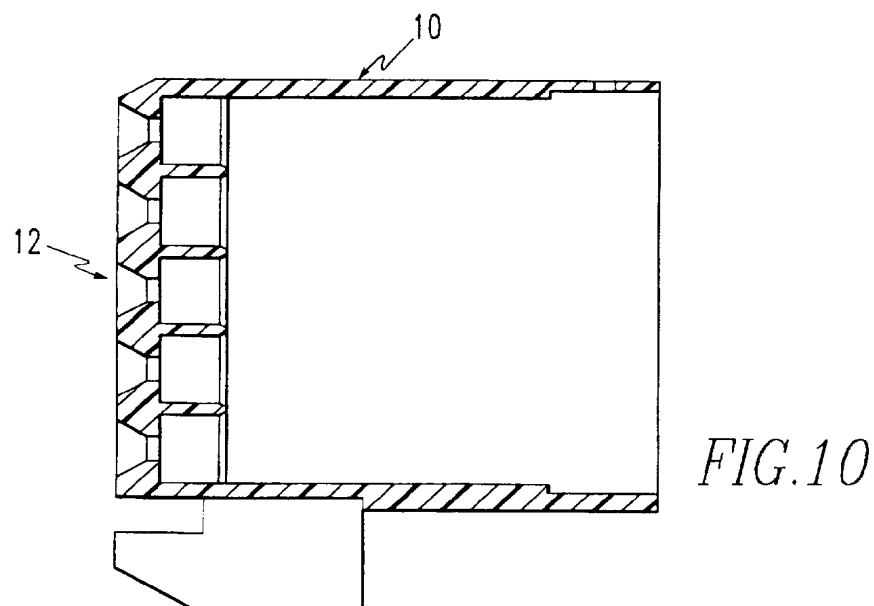
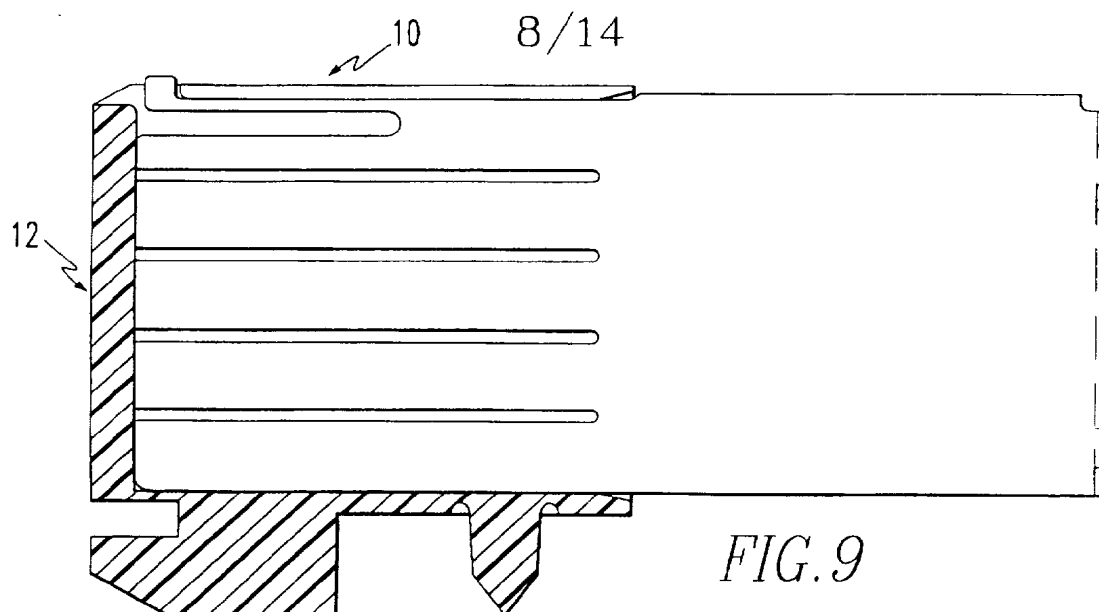


FIG. 4

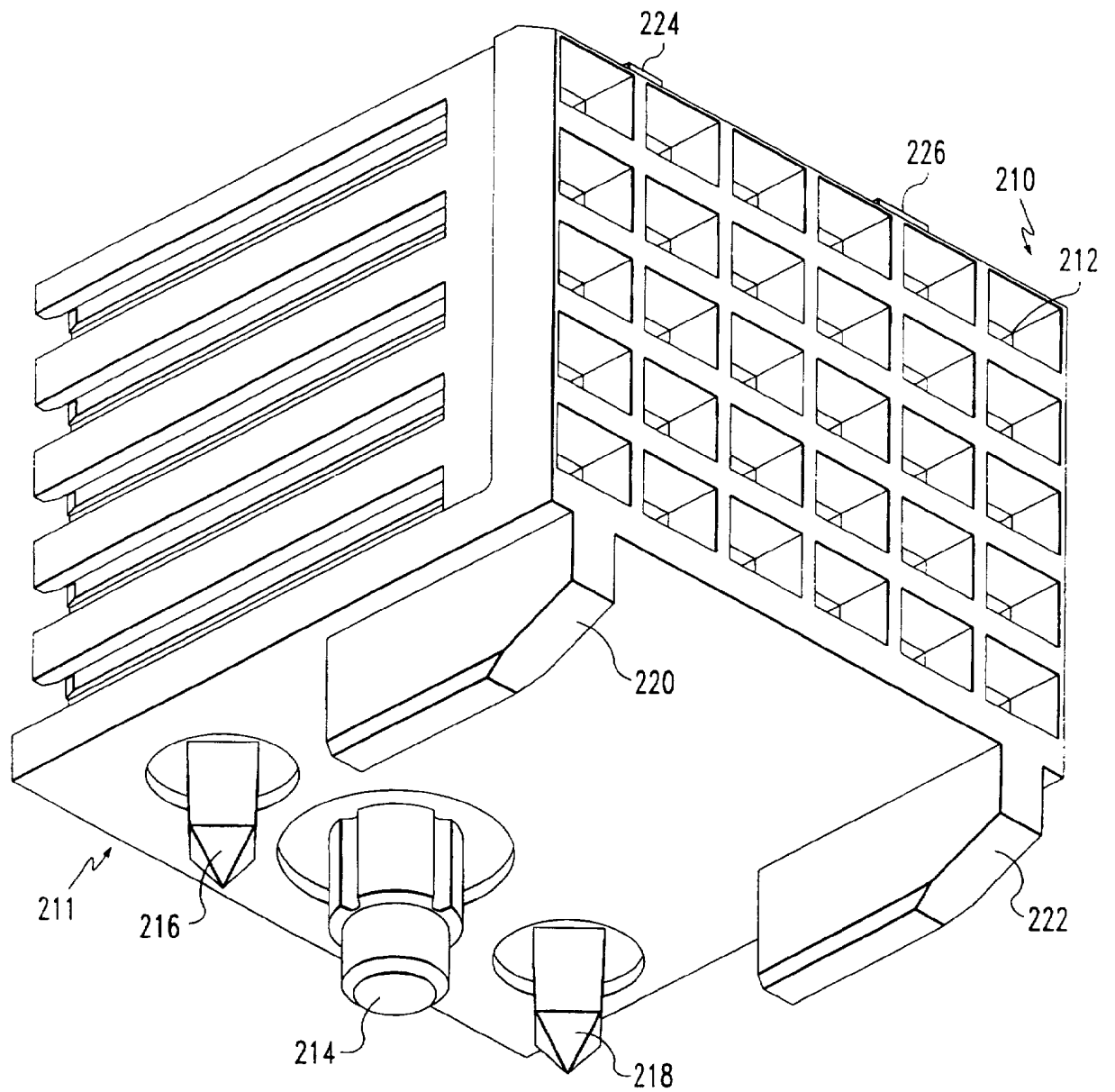
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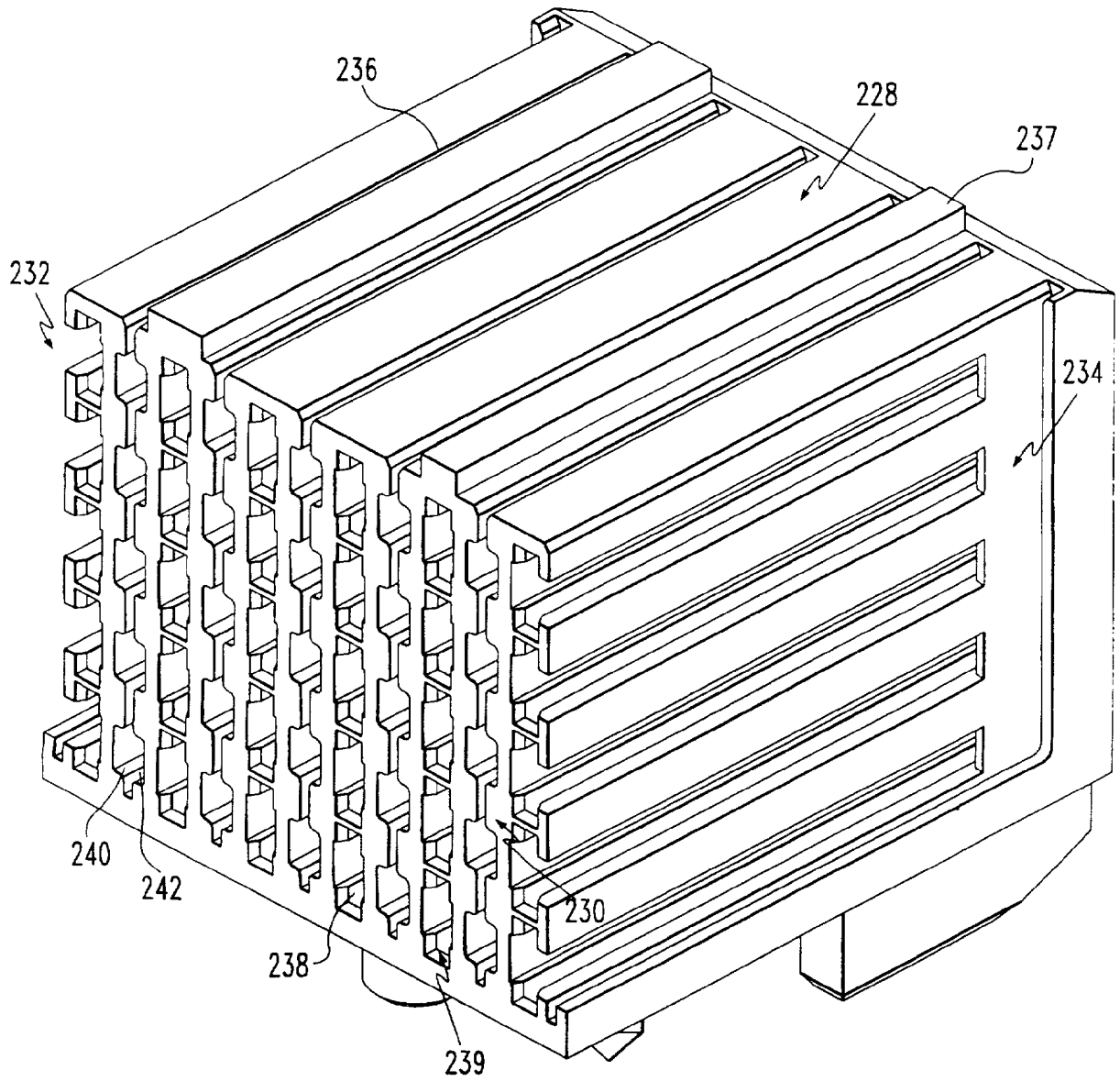




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*FIG. 13*

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*FIG. 14*

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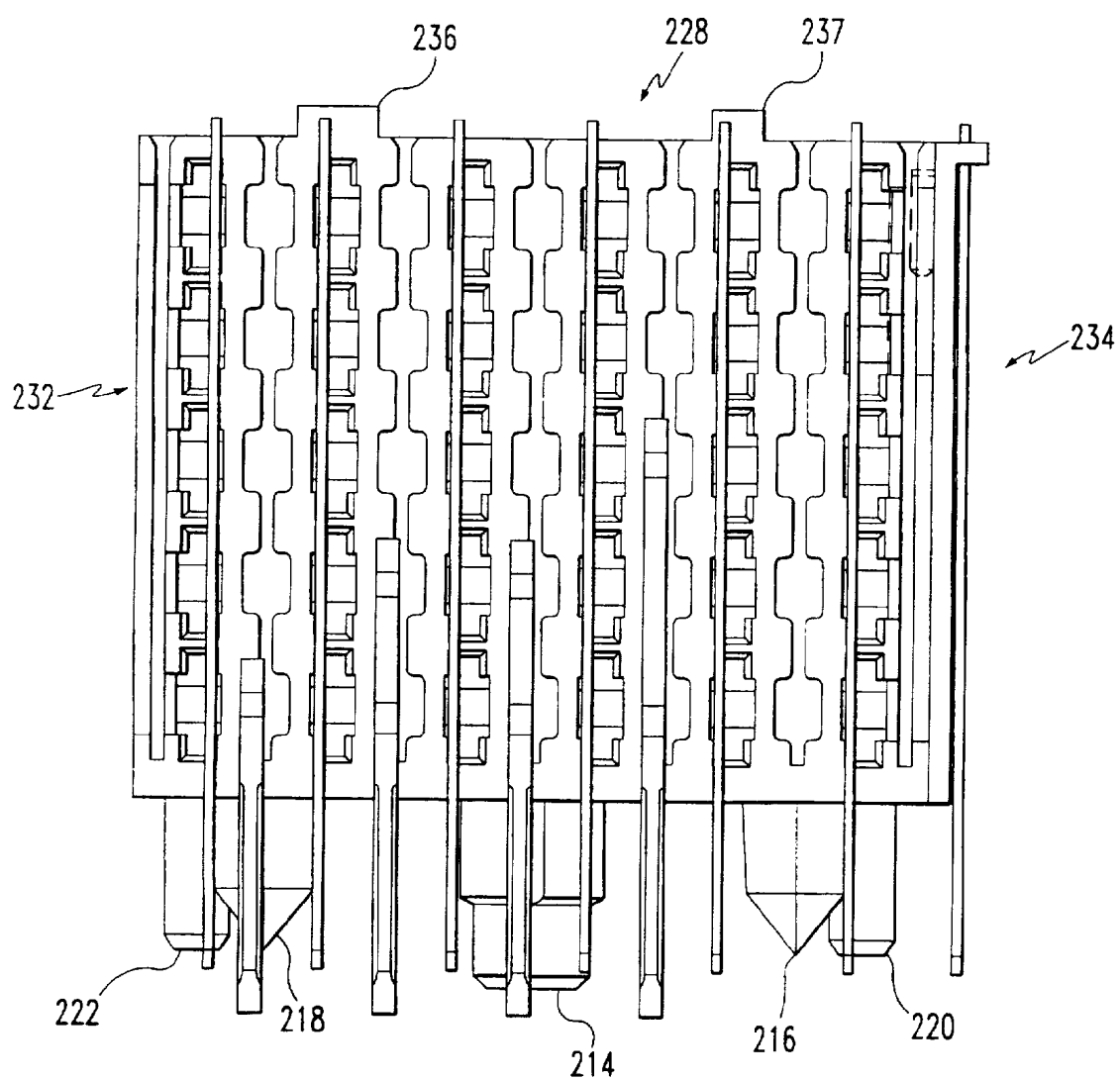
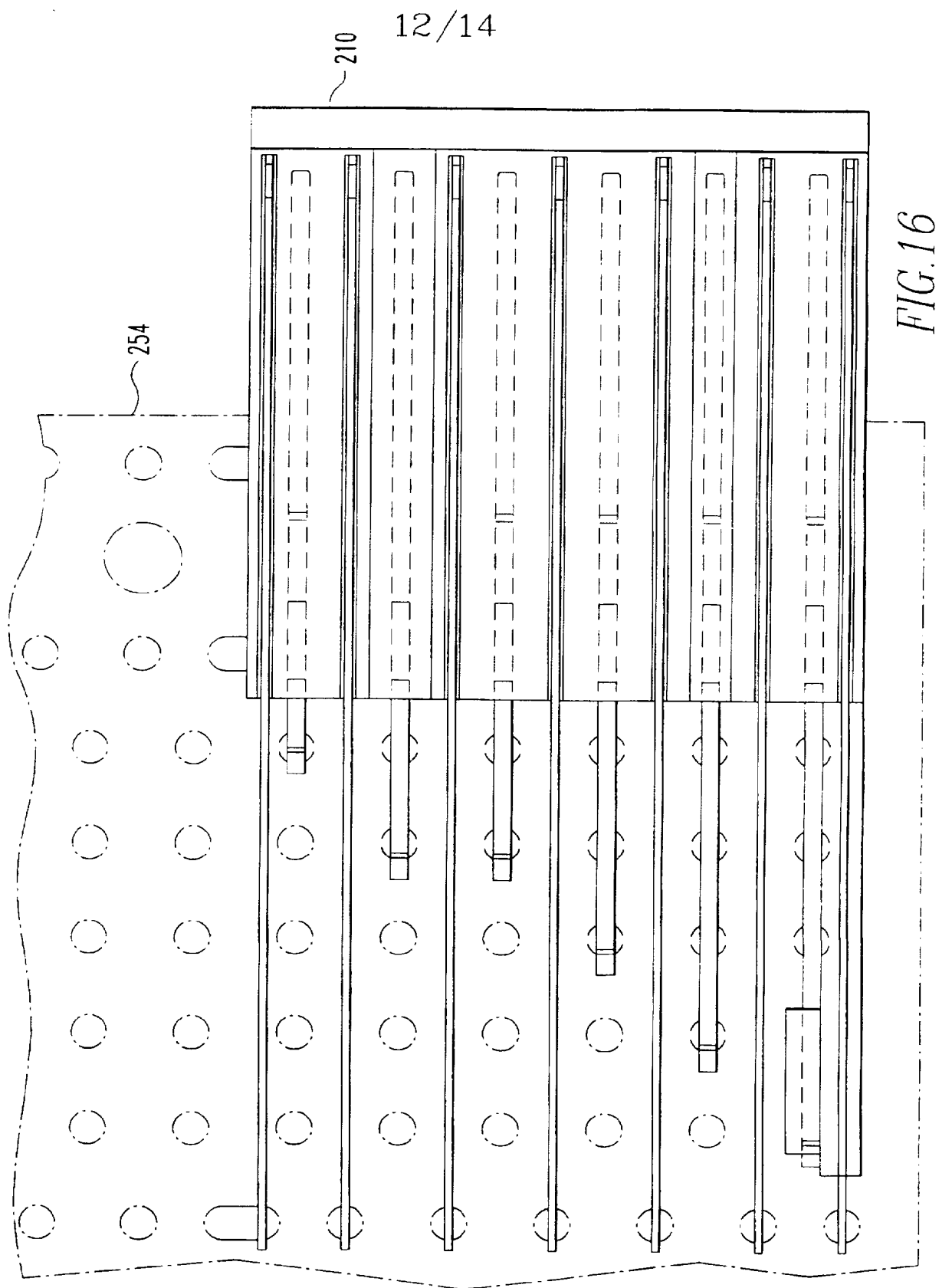
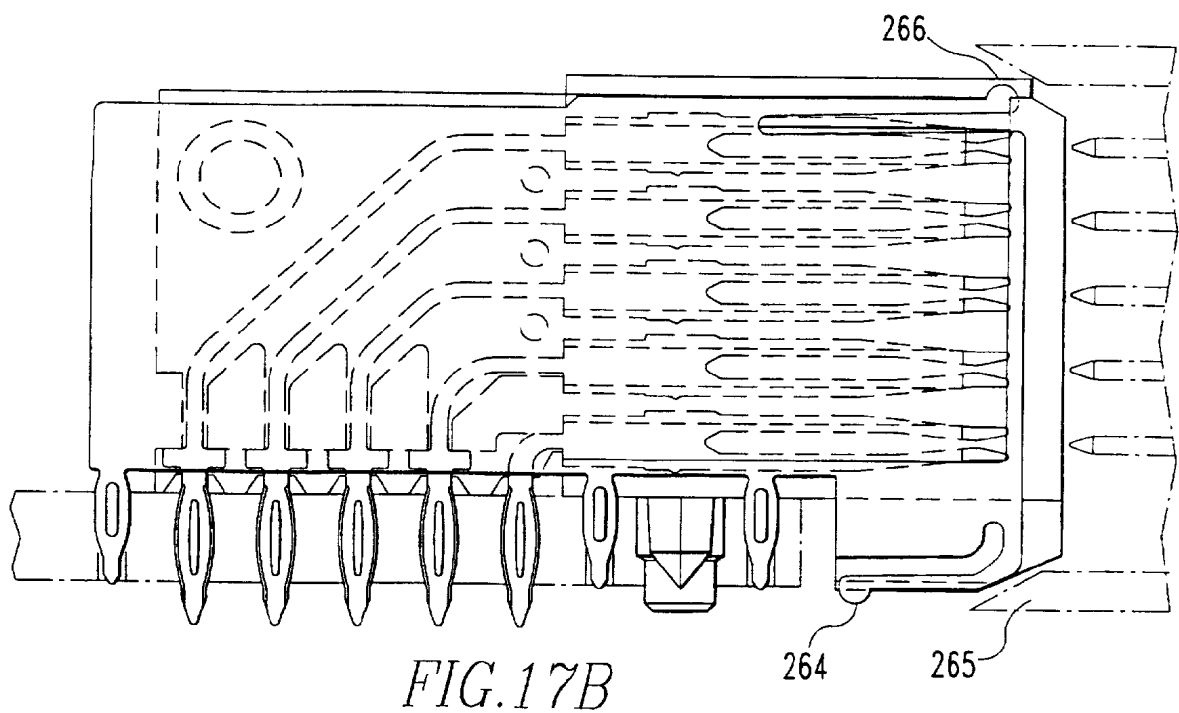
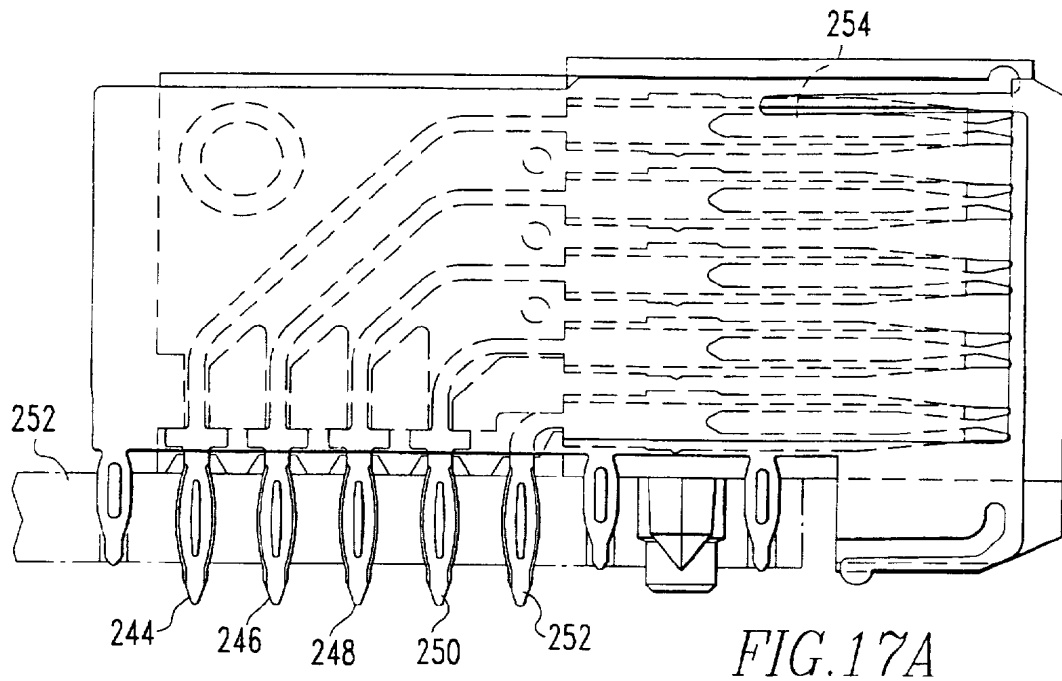


FIG. 15

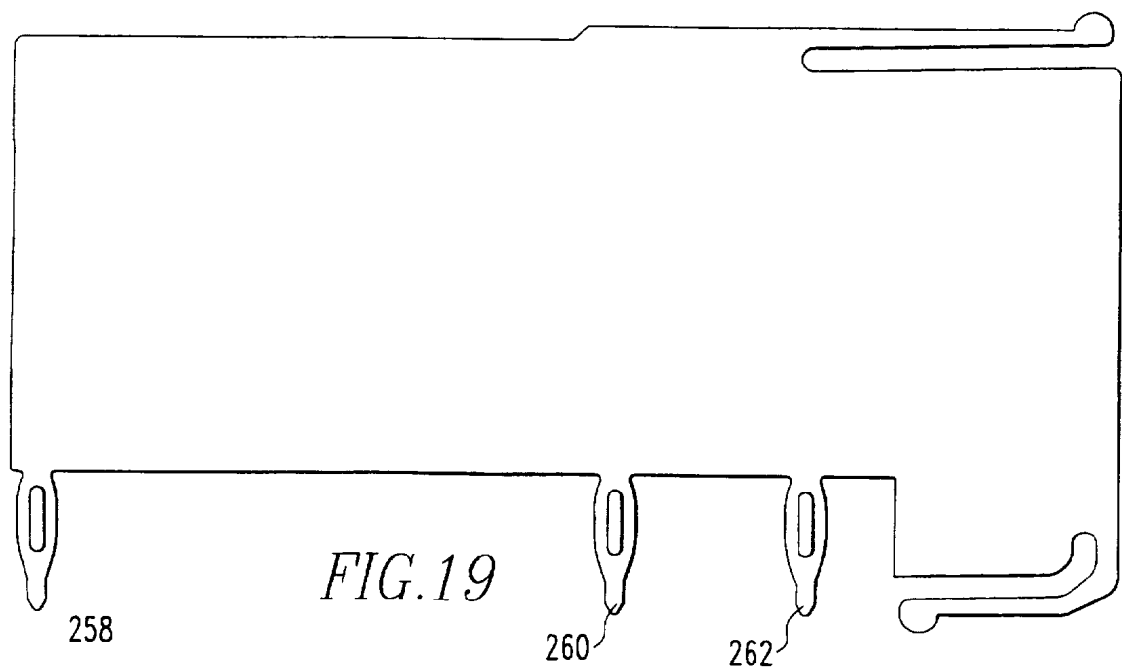
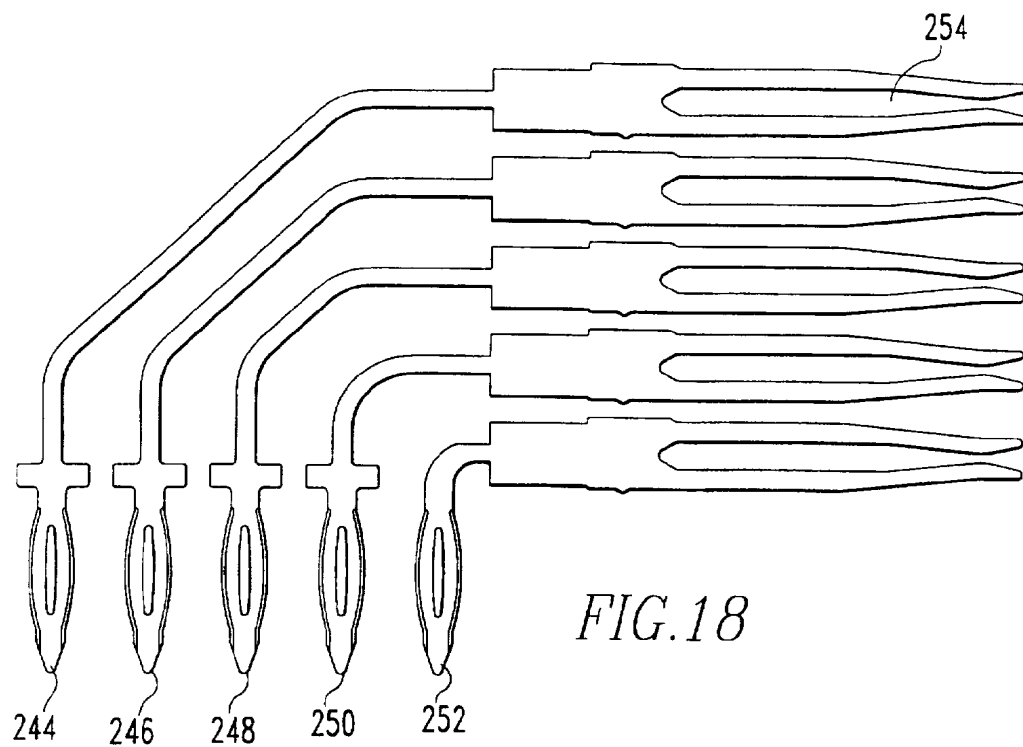




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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US97/14631

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : H01R 13/658

US CL : 439/608

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 439/608, 607, 1101, 108

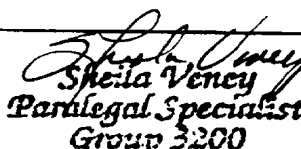
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
NONE

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 5,066,236 (BROEKSTEEG) 19 NOVEMBER 1991 SEE ENTIRE DOCUMENT	1-6,10,11
Y	US, A, 5,429,521 (MORLION ET AL) 04 JULY 1995 SEE ENTIRE DOCUMENT	1-6,10,11
Y	US, A, 5,433,618 (MORLION ET AL) 18 JULY 1995 SEE ENTIRE DOCUMENT	1-6,10,11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*B* earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*A* document member of the same patent family
*O* document referring to an oral disclosure, use, exhibition or other means	
*P* document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 23 SEPTEMBER 1997	Date of mailing of the international search report 31 OCT 1997
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer GARY PAUMEN Telephone No. (703) 308-1414  Paralegal Specialist Group 3200

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US97/14631

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.  
☒ No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US97/14631

### BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

This application contains claims directed to more than one species of the generic invention. These species are deemed to lack Unity of Invention because they are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for more than one species to be searched, the appropriate additional search fees must be paid. The species are as follows:

species 1: Figure 1; species 2: Figure 13.

The claims are deemed to correspond to the species listed above in the following manner:

species 1: claims 1-10; species 2: claim 11.

The following claims are generic: none

The species listed above do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the species lack the same or corresponding special technical features for the following reasons: each species has the technical feature of a different type of shielding arrangement.